

## CORRECTED VERSION

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date  
25 March 2004 (25.03.2004)

PCT

(10) International Publication Number  
**WO 2004/025832 A1**

(51) International Patent Classification<sup>7</sup>: **H03H 9/17**

(21) International Application Number:  
**PCT/IB2003/003993**

(22) International Filing Date:  
1 September 2003 (01.09.2003)

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:  
02256348.0 12 September 2002 (12.09.2002) EP

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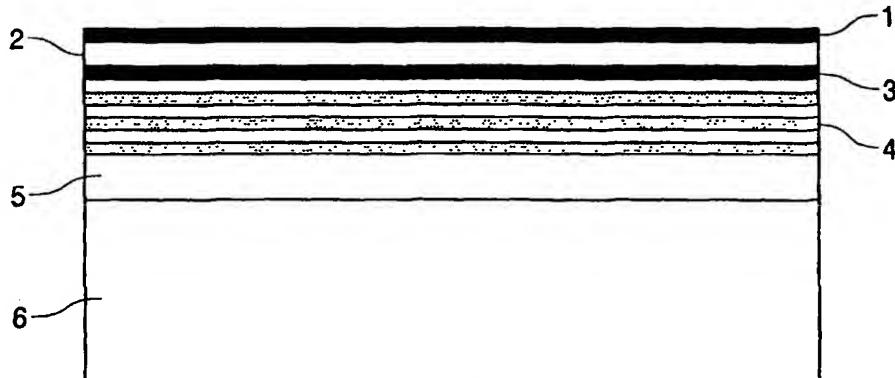
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(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*[Continued on next page]*

(54) Title: **BULK ACOUSTIC WAVE RESONATOR WITH MEANS FOR SUPPRESSION OF PASS-BAND RIPPLE IN BULK ACOUSTIC WAVE FILTERS**



**WO 2004/025832 A1**

(57) Abstract: A bulk acoustic wave resonator comprising a substrate (5), a Bragg reflector (4), a top (1) and a bottom (3) electrode and a piezoelectric layer (2) with means for suppression of the pass-band ripples in a bulk acoustic wave filter. The means for absorbing or scattering the spurious modes are a roughened rear side of the substrate (6), an absorbing layer (5) disposed on the rear side of the substrate (6) and/or an absorbing layer (5) disposed on the front side of the substrate.



**Published:**

— *with international search report*

**(48) Date of publication of this corrected version:**

10 March 2005

**(15) Information about Correction:**

see PCT Gazette No. 10/2005 of 10 March 2005, Section II

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP/03/03993

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H03H9/17

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H03H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 150 703 A (CRAWFORD JAY D ET AL) 21 November 2000 (2000-11-21) column 1, line 63 -column 2, line 5 column 3, line 57 -column 4, line 7 ---	1,2,4,5
Y	US 4 163 201 A (SUDO TOSHIO ET AL) 31 July 1979 (1979-07-31) column 5, line 48 -column 5, line 54 column 1, line 59 - line 64 ---	1,2,4,5
A	US 2001/048352 A1 (HERMANN WILHELM GEORG ET AL) 6 December 2001 (2001-12-06) column 4, line 15 -column 9, line 21 ---	1,3-6
A	EP 1 067 685 A (PHILIPS CORP INTELLECTUAL PTY ;KONINKL PHILIPS ELECTRONICS NV (NL)) 10 January 2001 (2001-01-10) column 4, line 5 -column 9, line 37 ---	1,3-6

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the International filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

18 November 2003

Date of mailing of the International search report

02/12/2003

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# INTERNATIONAL SEARCH REPORT

application No.  
PCT/IB 03/03993

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1a(see note below),2,4a(see note below),5

Bulk acoustic wave resonator with roughened rear side for suppression of pass-band ripple in bulk acoustic wave filters

Note:

Claim 1a :

A bulk acoustic wave (BAW) resonator comprising at least a bottom electrode(3), a piezoelectric layer(2) and a top electrode(1), a basic substrate(6) and means for absorbing or scattering spurious modes, characterized in that the means for absorbing or scattering modes are a roughened rear side of the basic substrate(6).

Claim 4a :

A bulk acoustic wave filter comprising at least two bulk acoustic wave resonators which comprise means for suppression of pass-band ripple in a ladder or in a lattice type configuration characterized in that the resonator's means for suppression of pass-band ripple are a roughened rear side of the basic substrate(6) and below a Bragg reflector(4).

2. Claims: 1b(see note below),3,4b(see note below),5,6

Bulk acoustic wave resonator with absorbing layer for suppression of pass-band ripple in bulk acoustic wave filters

Note:

Claim 1b :

A bulk acoustic wave (BAW) resonator comprising at least a bottom electrode(3), a piezoelectric layer(2) and a top electrode(1), a basic substrate(6) and means for absorbing or scattering spurious modes, characterized in that the means for absorbing or scattering modes are an absorbing layer(6) disposed on rear side of substrate(6) and/or on front side of substrate(6).

Claim 4b :

A bulk acoustic wave filter comprising at least two bulk acoustic wave resonators which comprise means for suppression of pass-band ripple in a ladder or in a lattice type configuration characterized in that the resonator's means for suppression of pass-band ripple are an absorbing layer(6) disposed on rear side of substrate(6) and/or on front side of substrate(6) and below a Bragg reflector(4).

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International

Application No

PCT/US-03/03993

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